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CAREER OBJECTIVES

My research interests lie in the field of marine ecology, the community ecology of invertebrates and the response of these communities and the surrounding ecosystem to changes in their environment. I am an interdisciplinary scientist, using a portfolio of both established and novel technological and biogeochemical techniques to investigate links between community diversity and ecosystem function, both *in situ* and in the laboratory.

PROFESSIONAL EXPERIENCE

February 2019 – Present

Marine Ecologist, National Institute of Water and Atmospheric Research (NIWA), Nelson, New Zealand

March 2014 – January 2019

Post-doctoral Research Fellow, University of Southampton, Southampton, UK

I managed the laboratory Health and Safety and Standard Operating Procedures for the Biodiversity and Ecosystem Futures Facility at the National Oceanography Centre. I was responsible for data archiving for all my projects, making sure data was stored and backed up in future-proofed file formats with associated metadata. I taught and mentored undergraduate, Masters and PhD students in the research group. In 2017 I won the university Dean's Prize Award for Citizenship and I was shortlisted (Top 3) for the Vice-Chancellors Early Career Award (2018).

Post-doctoral Research Projects:July 2018 – January 2019: **Project Leader, Marine Benthic Inter-tidal eDNA Pilot Project**

I obtained funding for this project and am project leader. This project aims to validate the use of environmental DNA (eDNA) as a method for rapid and cost-effective marine habitat assessment. The data and species obtained from intertidal sediment cores sampled across an impact gradient through traditional morphological identification will be compared to those obtained through eDNA sampling. We are also using eDNA methods to assess changes in the meiofaunal and bacterial communities along the gradient.

March 2016 – January 2019: **Research Fellow, NERC BLUEcoast:Physical and biological dynamic coastal processes and their role in coastal recovery.**

My work forms part of Work Package 3: Mixed sand-mud coasts and estuaries, looking at how biota mediate water flows and affect erosion thresholds under both current and future conditions. The aim of the project is to scale up local processes to determine estuarine sedimentary budgets and how estuarine morphology will be affected long term by climate change and increased frequencies of weather events.

March 2014 – Dec 2017: **Research Fellow, NERC Shelf Seas Biogeochemistry (SSB)**

My work forms part of Work Package 2: Biogeochemistry, macronutrient and carbon cycling in the benthic based in the Celtic Sea and Irish Seas. I took part in 4 research cruises, acting as Deputy Principal Scientist on one cruise. I used intact subsamples taken from NIOZ cores to run on-board and laboratory based incubations that investigated how sediment type, climate change and bottom fishing intensity affected marine benthic biodiversity, species activity (bioturbation and bioirrigation) and sediment carbon and nitrogen cycling. I am currently working with UK governmental organisations to translate this research into habitat report cards that will be used to inform policy makers and shape UK marine conservation.

October 2010 – March 2014

University Associate Tutor and Student Demonstrator, University of East Anglia, Norwich, UK

While undertaking my PhD I taught on a range of courses, including Research and Field Skills, Physical and Chemical Processes in the Earth's System, Aquatic Ecology, GIS Skills for Project Work and Sedimentology. I also acted as a supervisor for a number of undergraduate and master's student projects within my research group.

October 2009 – October 2010

Benthic Ecologist and Environmental Consultant with Ecospan Environmental Limited, Plymouth, UK

This primarily involved benthic invertebrate collection, identification and benthic lab management. I was also involved in ecotoxicity testing, particle size analysis, statistical data analysis and project reporting. I was required to manage my own time to meet project deadlines and work independently.

March 2007 – September 2007

Science Officer and Science Internship with Coral Cay Conservation, Tobago, West Indies and London, UK

The aim of the project in Tobago, in partnership with a local NGO, the Buccoo Reef Trust (BRT), was to inform the local government in how best to conserve their marine habitats. I organised the survey timetable giving marine ecology lectures and species data collection at the Coral Cay site in Tobago. I helped set up the expedition site and the science program, writing lectures on coral reef ecology, conservation, and coral, fish, invertebrate and algae identification and designing the survey procedures. I also helped run a summer school for local students with the BRT. The Science Internship involved writing scientific reports, collating scientific information and editing scientific materials to provide scientific and technical advice to Coral Cay Conservation staff, volunteers, and project partners.

July 2006 – March 2007

Museum Technician, Oxford University Natural History Museum, Oxford, UK

As a technician at the museum, I worked within the Zoology Department on the invertebrate collections, identifying, curating, organising and cataloguing the specimens.

EDUCATION

2010 – 2013

PhD in Environmental Science, University of East Anglia, UK

Thesis: The influence of macrofauna on intertidal sediment stability and biogeochemical properties

During my PhD I undertook large scale field experiments on the mudflat, organising and leading teams of research assistants into the field to collect my experimental data. Laboratory analysis involved biogeochemical analysis of sediment properties such as chlorophyll, carbohydrate and particle size. Additional laboratory experiments used two- and three-dimensional techniques to quantify bioturbation behaviour of marine invertebrates.

2008 – 2009

MSc (Distinction) in Applied Marine Science, University of Plymouth, UK with NERC Scholarship

Modules included: Marine Chemistry, Marine Pollution, Pollution Ecotoxicology, Near Shore Ecology, Integrated Coastal Zone Management and Physical Oceanography.

Thesis: The effect of CO₂ induced seawater acidification and elevated temperature on the diversity and structure of macro-invertebrate algal holdfast communities. Study undertaken with Plymouth Marine Laboratory.

2003 – 2006

BA (Hons.) 2,1 in Biological Sciences, Worcester College, University of Oxford, UK

Modules included: Cells and Development, Evolution and Systematics, Forestry, Pest Management, Marine Science, Tropical Forest Ecology, Conservation Genetics and Statistics and Quantitative Methods.

Thesis: The distribution and coral associations of polychaete tube worms in the Wakatobi Marine National Park, Sulawesi. Study undertaken with Operation Wallacea and an Oxford University Travel Grant.

1996 – 2003

Stockport Grammar School, Stockport, UK

A-Levels: Biology (A), Chemistry (A), Physics (A), and Maths (A).

PUBLICATIONS

Published or in press:

Thompson, C.E.L., Mayor, D., Fones, G., **Hale, R.** (2019). Across the sediment-water interface: Biogeochemical cycling in coastal and shelf seas. *Continental Shelf Research*, 185:1-2.

Solan, M., Ward, E.R., White, E.L., Hibberd, E.E., Cassidy, C., Schuster, J., **Hale, R.**, Godbold, J.A. (2019). Worldwide measurements of bioturbation intensity, ventilation rate, and the mixing depth of marine sediments. *Scientific Data*, 6:58. IF: 4.83

Hale, R., Jacques, R.O., Tolhurst, T., (2019) Determining how functionally diverse intertidal sediment species preserve mudflat ecosystem properties after abrupt biodiversity loss. *Journal of Coastal Research*, 35, 389-396. IF: 0.92

Hossain, M., Pogue, S., Trenchard, L., Van Oudenhoven, A., Washbourne, C.-L., Muiruri, E.W., Tomczyk, A., García-Llorente, M., **Hale, R.**, Hevia, V., Adams, T., Tavallali, L., de Bell, S., Pye, M., Resende, F., (2018)

Identifying future research directions for biodiversity, ecosystem services and sustainability: perspectives from early-career researchers. *International Journal of Sustainable Development & World Ecology*, 25, 249-261. IF: 2.37

Hale, R., Godbold, J.A., Sciberras, M., Dwight, J., Wood, C. L., Hiddink, J., Solan, M. (2017) Mediation of macronutrients and carbon by post-disturbance shelf sea sediment communities. *Biogeochemistry*, 135:1-34. IF: 3.27

Godbold, J.A., **Hale, R.**, Wood, C.L., Solan, M. (2017) Vulnerability of nutrient dynamics to the concurrent effects of enhanced temperature and atmospheric pCO₂ in representative shelf sea sediment habitats. *Biogeochemistry* 135:89-102 IF: 3.27

Sciebrass, M., Tait, K., Brochain, G., Hiddink, J.G., **Hale, R.**, Godbold, J.A., Solan, M., (2017) Mediation of nitrogen by post-disturbance shelf communities experiencing organic matter enrichment. *Biogeochemistry*, 135:135-153. IF: 3.27

Thompson, C.E.L., Silburn, B., Williams, M.E., Hull, T., Sivyver, D., Amoudry, L.O., Widdicombe, S., Ingels, J. , Carnovale, G., McNeill, C.L. , **Hale, R.**, Laguionie Marchais, C., Hicks, N., Smith, H., Klar, J.K., Hiddink, J.G., Kowalik, J, Kitidis, V., Reynolds, S., Woodward, E.M.S., Tate, K., Homoky, W.B, Kröger, S., Godbold, J.A., Aldridge, J., Mayor, D.J, Benoist, N.M.A., Bett, B.J., Morris, K.J., Parker E.R., Ruhl, H., Statham, P.J., Solan, M., (2017) An approach for the identification of exemplar sites for scaling up targeted field observations of benthic biogeochemistry in heterogeneous environments. *Biogeochemistry*, 135:1-34. IF: 3.27

Sarmiento, V.C., Santos, P.J.P, Ingels, J., Widdicombe, S., **Hale, R.**, (2017) Effects of elevated CO₂ and temperature on an intertidal harpacticoid copepod community..*ICES Journal of Marine Science* 74:1159-1169 IF: 2.76

Hale, R., Boardman, R., Mavrogordato, M., Sinclair, I., Tolhurst, T., Solan, M., (2015) High-resolution computed tomography reconstructions of invertebrate burrow systems. *Scientific Data*, 2, 150052 IF: 4.83

Hale, R., Jacques, R.O., Tolhurst, T., (2015) Cryogenic defaunation of sediments in the field. *Journal of Coastal Research*, 31:1537 -1540 IF: 0.92

Meadows, A.S., Ingels, J., Widdicombe, S., **Hale, R.**, Rundle, S.D., (2015). Effects of elevated CO₂ and temperature on an intertidal meiobenthic community. *Journal of Experimental Marine Biology and Ecology*. 469:44-56 IF: 1.80

Hale, R., Mavrogordato, M., Tolhurst, T., Solan, M., (2014) Characterisations of how species mediate ecosystem properties require more comprehensive functional effect descriptors. *Scientific Reports*. 4:6463 IF: 4.12

Hale, R., Calosi, P., McNeill, L., Mieszkowska, N., Widdicombe, S., (2011) Predicted levels of future ocean acidification and temperature rise could alter community structure and biodiversity in marine benthic communities. *Oikos*. 120(5), 661-674 IF: 3.71

Hale, R., De Grave, S., (2007) The first record of *Periclimenes platalea* Holthuis, 1951 (Decapoda, Pontoniinae) in the Western Atlantic. *Crustaceana*, 80(8), 1019-1021 IF: 0.73

In review or revision:

Bolam, S.G., Garcia, C., Sivyver, D., Parker, E.R., McClelland, I., Hale, R., Godbold, J., Solan, M., Widdicombe, S. (*in revision*). Relationships between functional traits of marine invertebrates and sediment biogeochemical properties. *Marine Ecology Progress Series*.

Tait, K. **Hale, R.** Solan, M., Widdicombe, S., Godbold, J.A., (*in review*). Interactive effects of sediment type, invertebrate burrows and coupled warming and acidification on ammonia oxidising archaea and bacteria. *Environmental Microbiology Reports*

GRANTS

July 2018 - £5,000 **Marine Benthic Intertidal eDNA identification Pilot Project**. Funded by Natural England.

January 2018 - \$2,070 **Grant to support participation in 2nd Benthic Invertebrate Taxonomy, Metagenomics, and Bioinformatics (BITMaB-2) Workshop** held January 2018 at Texas A&M University, Corpus Christi, US

May 2016 - £1,588 **Travel Grant from Commonwealth Scientific and Industrial Research Organisation**, Australia to attend the Ocean in a High CO₂ World Symposium 2016.

December 2015 - £22,000 **Supplementary project funding** NERC SSB WP2-WP4 partnership for regional scale effects of future climates: Change in functional traits under altered climatic regimes.

April 2015 - £1,467 **Malacological Society of London Research Grant** Habitat heterogeneity and burrowing behaviour in an intertidal gastropod

February 2014 - £52,136 Named postdoc and contributor: **NERC Urgency Grant NE/M001261/1** Impacts of the December 2013 storm surge on the North Norfolk Coast. PI: Dr Trevor Tolhurst, University of East Anglia, UK

October 2013 - £1,400 **Travel grant from the University of East Anglia** to attend the Ocean Sciences Meeting 2014, Honolulu, US

October 2012 - £1,000 **Travel grant** from the Henry and Betty Moore Foundation and the Scientific Committee on Ocean Research to attend the Third International Symposium on the Ocean in a High-CO₂ World, Monterey, US

October 2010 – **Fully Funded University of East Anglia PhD studentship**

October 2008 - £4,500 **NERC scholarship** for MSc in Applied Marine Science at the University of Plymouth

RECENT WORKSHOPS AND PRESENTATIONS

Conference: New Zealand Ocean Acidification Conference, Wellington 2020. **Poster Presentation:** Benthic fishing in a high CO₂ world alters community structure and function. **Poster Presentation:** Predicted levels of future ocean acidification and temperature rise could alter community structure and biodiversity in marine benthic communities.

Workshop Invited Participant: What if climate change was purple? 2019 A multi-year project bringing together artists and scientists to create artworks that inspire climate action. Wellington, NZ

Conference: 13th International Polychaete Conference 2019, Long Beach, USA. **Oral Presentation:** Burrow dimensions and network properties in heterogeneous habitats. **Poster Presentation:** Role of spatial and temporal heterogeneity in moderating temperate shelf sea carbon and macronutrient stocks.

Conference Session Organiser: #FlumeFriday: Sharing insights and expertise from physical modelling experiments, April 2019, Vienna, Austria.

Conference Invited participant: National Open Ocean Exploration Forum “All Hands on Deck” November 2018, Boston, US.

Conference: World Conference on Marine Biodiversity 2018, Montreal, Canada. **Oral Presentation:** Role of temporal heterogeneity and sediment type in moderating shelf sea ecosystem function

Workshop: 2nd Benthic Invertebrate Taxonomy, Metagenomics, and Bioinformatics (BITMaB-2). January 2018, Texas A&M University, Corpus Christi, United States.

Conference Organiser: FNES Early Career Researcher and Teaching Fellow Conference 2017, Southampton, UK.

Conference: 5th Nereis Park Conference, Stony Brook University August 2017. **Oral Presentation:** Burrow dimensions and network properties in heterogeneous habitats.

Workshop: NERC UK-Canada Low Emission Climate Change Scenario workshop July 2017, Quebec, Canada.

Conference: Ocean in a High CO₂ World Symposium 2016, Hobart, Australia. **Oral Presentation:** Trawling in a high CO₂ world alters community structure and functioning in marine benthic communities.

Conference: ASLO Aquatic Sciences Meeting, Granada, Spain. February 2015. **Oral Presentation:** Global patterns of nutrient cycling in shelf sea sediments.

Conference: Next Research Generation Biodiversity, Ecosystem Services and Sustainability, Southampton, UK. September 2014. **Oral Presentation:** The role of biodiversity in mediating coastal ecosystem properties.

TRAINING COURSES

Software Carpentry, Data Carpentry, Image Analysis Using FIJI, Analysing Complex Networks in R, NERC Modelling Dynamic Systems in R (ODE Models), Use of the European Regional Seas Ecosystem Model (ERSEM), Regression Models with Spatial and Temporal Correlation, Linear Mixed Effects Models and Mixed Modelling using Bayesian Statistics, Image analysis using Image J, Using Twitter for Policy, Risk Assessment, Using Display Screen Equipment, Health and Safety,

POSITIONS OF RESPONSIBILITY

- Secretary and Ocean and Earth Science (OES) representative for the University of Southampton Women in Science Engineering and Technology committee (WiSET) 2015-2019. This committee supports and celebrates the work of female academics at the University of Southampton. Additionally, I was organiser of the WiSET annual Campbell Lecture that highlights the issues facing female scientists at all stages of their career.
 - Ocean and Earth Science Early Career Researcher Representative on the OES Equality, Diversity and Inclusivity Committee 2015-2019, working to improve fairness and equality for both women and men at the university, eliminate gender bias and create an inclusive culture.
 - Early Career Researcher Representative at School level and on the University of Southampton Concordat Researcher Development Committee. I organised School and Faculty based training for ECRs based on identified needs and feedback. I also co-ran a seminar series in the Ocean and Earth Science department.
 - Secretary for INNGE and have been leading the organisation's application for charity status as a Charitable Incorporated Organisation (CIO), 2015-2019.
 - Deputy Principal Scientist for the DY034 research cruise on RRS Discovery and in charge of leading the night shift team and science program, 2015.
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